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SEQUENCE LISTING

<110> E.I. du Pont de Nemours and Company  
Hallahan, David L.

<120> CIS-PRENYLTRANSFERASES FROM THE RUBBER-PRODUCING PLANTS RUSSIAN DANDELION  
(TARAXACUM KOK-SAGHYZ) AND SUNFLOWER (HELIANTHUS ANNUS)

<130> CL2039

<160> 45

<170> PatentIn version 3.1

<210> 1

<211> 746

<212> DNA

<213> Taraxacum kok-saghyz

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aaggagctcc ggcgaaacaa ggctgagcaa ctttctgctg tggcagacca ccaactgttt 420  
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&lt;212&gt; DNA

&lt;213&gt; Taraxacum kok-saghyz

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&lt;212&gt; DNA

&lt;213&gt; Taraxacum kok-saghyz

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<212> PRT

<213> Taraxacum kok-saghyz

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Asn Ala Thr Leu Arg Lys Leu Val Phe Arg Val Ile Ala Ser Arg Pro  
35 40 45

Ile Pro Glu His Ile Ala Phe Ile Leu Asp Gly Asn Arg Arg Phe Ala  
50 55 60

Arg Lys Trp Asn Leu Thr Glu Gly Ala Gly His Lys Thr Gly Phe Leu  
65 70 75 80

Ala Leu Met Ser Val Leu Lys Tyr Cys Tyr Glu Ile Gly Val Lys Tyr  
85 90 95

Val Thr Ile Tyr Ala Phe Ser Leu Asp Asn Phe Asn Arg Arg Pro Asp  
100 105 110

Glu Val Gln Tyr Val Met Asp Leu Met Gln Asp Lys Ile Glu Gly Phe  
115 120 125

Leu Lys Glu Val Ser Ile Ile Asn Gln Tyr Gly Val Arg Val Leu Phe  
130 135 140

Ile Gly Asp Leu Asp Arg Leu Tyr Glu Pro Val Arg Ile Ala Ala Glu  
145 150 155 160

Lys Ala Met Glu Ala Thr Ala Lys Asn Ser Thr Thr Tyr Leu Leu Val  
165 170 175

Cys Val Ala Tyr Thr Ser Ser His Glu Ile Pro Arg Ala Ile His Glu  
180 185 190

Ala Cys Glu Glu Ser Ile Arg Val Met Asn Gly Asn Gly Phe Phe Asn  
 195 200 205

Gly Ser Gly Tyr Thr Asn Val Asn His Gly Ser Gln Ala Val Ile Lys  
 210 215 220

Val Val Asp Leu Asp Lys His Met Tyr Met Gly Val Ala Pro Asp Pro  
 225 230 235 240

Asp Ile Leu Val Arg Ser Ser Gly Glu Thr Arg Leu Ser Asn Phe Leu  
 245 250 255

Leu Trp Gln Thr Thr Asn Cys Leu Leu Tyr Ser Pro Lys Ala Leu Trp  
 260 265 270

Pro Glu Met Gly Phe Trp Gln Val Val Trp Gly Ile Leu Glu Phe Gln  
 275 280 285

Asn Asn Tyr Asn Tyr Leu Glu Lys Lys Lys Lys Gln Ala  
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&lt;211&gt; 505

&lt;212&gt; DNA

&lt;213&gt; Helianthus annuus

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&lt;211&gt; 168

&lt;212&gt; PRT

&lt;213&gt; Helianthus annuus

&lt;400&gt; 6

Thr Arg Lys Ile Glu Gly Phe Met Lys Glu Leu Thr Ile Val Asn Arg  
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Tyr Gly Val Arg Val Leu Phe Ile Gly Asp Leu Lys Arg Leu Tyr Glu  
 20 25 30

Pro Val Arg Val Ala Ala Glu Lys Ala Met Glu Ala Thr Ala Asn Asn  
 35 40 45

Thr His Thr Tyr Leu Leu Val Cys Val Ala Tyr Thr Ser Ser His Glu  
 50 55 60

Ile Pro Arg Ala Val Tyr Glu Ser Cys Glu Glu Lys Ser Gly Gly Thr  
 65 70 75 80

Gly Val Met Ile Asn Gly Asn Gly Ser Val Asn Gly Asp Tyr Ser Glu  
 85 90 95

Glu Lys Ser Gly Gly Thr Gly Val Met Val Asn Gly Asn Gly Ser Val  
 100 105 110

Asn Gly Asp Tyr Ser Asn Gly Asp His Glu Glu Gly Val Lys Val Val  
 115 120 125

Asp Ile Asp Lys His Met Tyr Met Ala Val Ala Pro Asp Pro Asp Ile  
 130 135 140

Leu Val Arg Ser Ser Gly Glu Thr Arg Leu Ser Asn Phe Leu Leu Trp  
 145 150 155 160

Gln Thr Thr Asn Cys Val Leu Tyr  
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&lt;210&gt; 7

&lt;211&gt; 228

&lt;212&gt; PRT

&lt;213&gt; calendula officinalis

&lt;400&gt; 7

Met Pro Lys His Val Ala Phe Ile Met Asp Gly Asn Arg Arg Trp Ala  
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Val Glu Lys Gly Trp Ser Pro Met Thr Gly His Ser Ala Met Arg Lys  
 20 25 30

Thr Leu Gln Ser Leu Leu Phe Arg Cys Ser Lys Phe Lys Ile Lys Ala  
 35 40 45

Val Ser Ile Tyr Ala Phe Ser Thr Glu Asn Trp Thr Arg Pro Lys Glu  
50 55 60

Glu Val Asp Phe Leu Met Glu Met Tyr Glu Asp Leu Leu Arg Thr Asp  
65 70 75 80

Ala Glu Glu Leu Leu Ser Leu Gly Cys Arg Val Ser Ile Met Gly Lys  
85 90 95

Lys Thr Asn Leu Pro Lys Ser Leu Gln Lys Leu Cys Ile Glu Ile Glu  
100 105 110

Glu Lys Ser Arg Ala Asn Ser Gly Thr His Val Asn Tyr Ala Leu Asn  
115 120 125

Tyr Ser Gly Lys Tyr Asp Ile Ile Glu Ala Cys Lys Ser Val Ala Thr  
130 135 140

Lys Val Lys Asp Gly Val Ile Ile Pro Lys Gln Ile Asp Glu Lys Tyr  
145 150 155 160

Phe Lys Gln Glu Leu Gly Thr Lys Met Ile Asp Phe Pro Tyr Pro Asp  
165 170 175

Leu Val Ile Arg Thr Ser Gly Glu Ile Arg Leu Ser Asn Phe Met Leu  
180 185 190

Trp Gln Met Ala Tyr Ser Glu Leu Tyr Phe Thr Asp Lys Tyr Phe Pro  
195 200 205

Asp Phe Gly Glu Asn Asp Leu Ile Glu Ala Leu Leu Ala Phe Gln Lys  
210 215 220

Val Arg Lys Cys  
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<211> 290

<212> PRT

<213> Hevea brasiliensis

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Lys Tyr Met Arg Lys Gly Leu Tyr Ser Ile Leu Thr Gln Gly Pro Ile  
20 25 30

Pro Thr His Ile Ala Phe Ile Leu Asp Gly Asn Arg Arg Phe Ala Lys  
 35 40 45  
 Lys His Lys Leu Pro Glu Gly Gly Gly His Lys Ala Gly Phe Leu Ala  
 50 55 60  
 Leu Leu Asn Val Leu Thr Tyr Cys Tyr Glu Leu Gly Val Lys Tyr Ala  
 65 70 75 80  
 Thr Ile Tyr Ala Phe Ser Ile Asp Asn Phe Arg Arg Lys Pro His Glu  
 85 90 95  
 Val Gln Tyr Val Met Asp Leu Met Leu Glu Lys Ile Glu Gly Met Ile  
 100 105 110  
 Met Glu Glu Ser Ile Ile Asn Ala Tyr Asp Ile Cys Val Arg Phe Val  
 115 120 125  
 Gly Asn Leu Lys Leu Leu Ser Glu Pro Val Lys Thr Ala Ala Asp Lys  
 130 135 140  
 Ile Met Arg Ala Thr Ala Asn Asn Ser Lys Cys Val Leu Leu Ile Ala  
 145 150 155 160  
 Val Cys Tyr Thr Ser Thr Asp Glu Ile Val His Ala Val Glu Glu Ser  
 165 170 175  
 Ser Glu Leu Asn Ser Asn Glu Val Cys Asn Asn Gln Glu Leu Glu Glu  
 180 185 190  
 Ala Asn Ala Thr Gly Ser Ser Thr Val Ile Gln Thr Glu Asn Met Glu  
 195 200 205  
 Ser Tyr Ser Gly Ile Lys Leu Val Asp Leu Glu Lys Asn Thr Tyr Ile  
 210 215 220  
 Asn Pro Tyr Pro Asp Val Leu Ile Arg Thr Ser Gly Glu Thr Arg Leu  
 225 230 235 240  
 Ser Asn Tyr Leu Leu Trp Gln Thr Thr Asn Cys Ile Leu Tyr Ser Pro  
 245 250 255  
 Tyr Ala Leu Trp Pro Glu Ile Gly Leu Arg His Val Val Trp Ser Val  
 260 265 270  
 Ile Asn Phe Gln Arg His Tyr Ser Tyr Leu Glu Lys His Lys Glu Tyr  
 275 280 285  
 Leu Lys  
 290

&lt;210&gt; 9

&lt;211&gt; 290

&lt;212&gt; PRT

&lt;213&gt; Hevea brasiliensis

&lt;400&gt; 9

Met Glu Leu Tyr Asn Gly Glu Arg Pro Ser Val Phe Arg Leu Leu Glu  
 1 5 10 15

Lys Tyr Met Arg Lys Gly Leu Tyr Ser Ile Leu Thr Gln Gly Pro Ile  
 20 25 30

Pro Thr His Ile Ala Phe Ile Leu Asp Gly Asn Arg Arg Phe Ala Lys  
 35 40 45

Lys His Lys Leu Pro Glu Gly Gly Gly His Lys Ala Gly Phe Leu Ala  
 50 55 60

Leu Leu Asn Val Leu Thr Tyr Cys Tyr Glu Leu Gly Val Lys Tyr Ala  
 65 70 75 80

Thr Ile Tyr Ala Phe Ser Ile Asp Asn Phe Arg Arg Lys Pro His Glu  
 85 90 95

Val Gln Tyr Val Met Asp Leu Met Leu Glu Lys Ile Glu Gly Met Ile  
 100 105 110

Met Glu Glu Ser Ile Ile Asn Ala Tyr Asp Ile Cys Val Arg Phe Val  
 115 120 125

Gly Asn Leu Lys Leu Leu Ser Glu Pro Val Lys Thr Ala Ala Asp Lys  
 130 135 140

Ile Met Arg Ala Thr Ala Asn Asn Ser Lys Cys Val Leu Leu Ile Ala  
 145 150 155 160

Val Cys Tyr Thr Ser Thr Asp Glu Ile Val His Ala Val Glu Glu Ser  
 165 170 175

Ser Glu Leu Asn Ser Asn Glu Val Cys Asn Asn Gln Glu Leu Glu Glu  
 180 185 190

Ala Asn Ala Thr Gly Ser Ser Thr Val Ile Gln Thr Glu Asn Met Glu  
 195 200 205

Ser Tyr Ser Gly Ile Lys Leu Val Asp Leu Glu Lys Asn Thr Tyr Ile  
 210 215 220

Asn Pro Tyr Pro Asp Val Leu Ile Arg Thr Ser Gly Glu Thr Arg Leu  
 Page 8



225                      230                      235                      240  
 Ser Asn Tyr Leu Leu Trp Gln Thr Thr Asn Cys Ile Leu Tyr Ser Pro  
                                  245                      250                      255  
 Tyr Ala Leu Trp Pro Glu Ile Gly Leu Arg His Val Val Trp Ser Val  
                                  260                      265                      270  
 Ile Asn Phe Gln Arg His Tyr Ser Tyr Leu Glu Lys His Lys Glu Tyr  
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 Leu Lys  
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<211> 296

<212> PRT

<213> Hevea brasiliensis

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                                  20                      25                      30  
 Pro Thr His Leu Ala Phe Ile Met Asp Gly Asn Arg Arg Phe Ala Lys  
                                  35                      40                      45  
 Lys His Lys Met Lys Glu Ala Glu Gly Tyr Lys Ala Gly Tyr Leu Ala  
                                  50                      55                      60  
 Leu Leu Arg Thr Leu Thr Tyr Cys Tyr Glu Leu Gly Val Arg Tyr Val  
 65                      70                      75                      80  
 Thr Ile Tyr Ala Phe Ser Ile Asp Asn Phe Arg Arg Gln Pro Arg Glu  
                                  85                      90                      95  
 Val Gln Cys Val Met Asn Leu Met Met Glu Lys Ile Glu Glu Ile Ile  
                                  100                      105                      110  
 Val Glu Glu Ser Ile Met Asn Ala Tyr Asp Val Gly Val Arg Ile Val  
                                  115                      120                      125  
 Gly Asn Leu Asn Leu Leu Asp Glu Pro Ile Arg Ile Ala Ala Glu Lys  
                                  130                      135                      140  
 Ile Met Arg Ala Thr Ala Asn Asn Ser Gly Phe Val Leu Leu Ile Ala  
 145                      150                      155                      160

Val Ala Tyr Ser Ser Thr Asp Glu Ile Gly His Ala Val Glu Glu Ser  
165 170 175

Ser Lys Asp Lys Leu Asn Ser Asn Glu Val Cys Asn Asn Gly Ile Glu  
180 185 190

Ala Glu Gln Glu Phe Lys Glu Ala Asn Gly Thr Gly Asn Ser Val Ile  
195 200 205

Pro Val Gln Lys Thr Glu Ser Tyr Ser Gly Ile Asn Leu Ala Asp Leu  
210 215 220

Glu Lys Asn Thr Tyr Val Asn Pro His Pro Asp Val Leu Ile Arg Thr  
225 230 235 240

Ser Gly Leu Ser Arg Leu Ser Asn Tyr Leu Leu Trp Gln Thr Ser Asn  
245 250 255

Cys Ile Leu Tyr Ser Pro Phe Ala Leu Trp Pro Glu Ile Gly Leu Arg  
260 265 270

His Leu Val Trp Thr Val Met Asn Phe Gln Arg His His Ser Tyr Leu  
275 280 285

Glu Lys His Lys Glu Tyr Leu Lys  
290 295

<210> 11

<211> 309

<212> PRT

<213> Vitis sp.

<400> 11

Met Leu Ser Phe Arg Phe Pro Ile Ser Ala Asp Asn Ala Arg His Thr  
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Phe Lys Ser Lys His Ser Ser Cys Thr Phe Arg Ser Asn Arg Ile Asp  
20 25 30

Ser Phe Ser Phe Pro Pro Ile Ser Val Pro Arg Phe His Lys Leu Arg  
35 40 45

Thr Ala Lys Thr Asp Val Val Gly Glu Glu Glu Ala Arg Glu Val Asn  
50 55 60

Glu Arg Ala Glu Glu Phe Pro Asp Gly Leu Arg Arg Glu Leu Met Pro  
65 70 75 80

Glu His Val Ala Val Ile Met Asp Gly Asn Val Arg Trp Ala Gln Lys  
 85 90 95  
 Arg Gly Leu Pro Ala Ala Ser Gly His Gln Ala Gly Val Arg Ser Leu  
 100 105 110  
 Arg Glu Leu Val Glu Leu Cys Cys Lys Trp Gly Ile Lys Val Leu Ser  
 115 120 125  
 Val Phe Ala Phe Ser Tyr Asp Asn Trp Ser Arg Ser Glu Gly Glu Val  
 130 135 140  
 Gly Phe Leu Met Ser Leu Ile Glu Arg Val Val Lys Ala Glu Leu Pro  
 145 150 155 160  
 Ile Leu Gly Gly Lys Ala Phe Glu Cys Arg Asp Trp Gly Phe Val Lys  
 165 170 175  
 Ala Ser Glu Gln Leu Gln Leu Ile Ile Asp Val Glu Glu Thr Thr Lys  
 180 185 190  
 Glu Asn Ser Arg Leu Gln Phe Ile Val Ala Leu Ser Tyr Ser Gly Gln  
 195 200 205  
 Cys Asp Ile Leu Gln Ala Cys Lys Asn Ile Gly His Lys Val Lys Asp  
 210 215 220  
 Gly Leu Ile Glu Pro Glu Asp Ile Asn Lys Ser Leu Ile Glu Gln Glu  
 225 230 235 240  
 Leu Gln Thr Asn Cys Thr Glu Phe Pro Phe Pro Asp Leu Leu Ile Arg  
 245 250 255  
 Thr Ser Gly Glu Leu Arg Val Ser Asn Phe Met Leu Trp Gln Ile Ala  
 260 265 270  
 Tyr Thr Glu Leu Cys Phe Phe Ser Thr Leu Trp Pro Asp Phe Gly Lys  
 275 280 285  
 Asp Glu Phe Val Glu Ala Leu Ser Ser Phe Gln Lys Arg Gln Arg Arg  
 290 295 300  
 Tyr Gly Gly Arg Asn  
 305

&lt;210&gt; 12

&lt;211&gt; 252

&lt;212&gt; PRT

&lt;213&gt; Oryza sativa

&lt;400&gt; 12

Met Pro Lys His Ile Ala Phe Ile Met Asp Gly Asn Arg Arg Tyr Ala  
1 5 10 15

Lys Phe Arg Ser Ile Gln Glu Gly Ser Gly His Arg Val Gly Phe Ser  
20 25 30

Ala Leu Ile Ala Ser Leu Leu Tyr Cys Tyr Glu Met Gly Val Lys Tyr  
35 40 45

Ile Thr Val Tyr Ala Phe Ser Ile Asp Asn Phe Lys Arg Asp Pro Thr  
50 55 60

Glu Val Lys Ser Leu Met Glu Leu Met Glu Glu Lys Ile Asn Glu Leu  
65 70 75 80

Leu Glu Asn Arg Asn Val Ile Asn Lys Val Asn Cys Lys Ile Asn Phe  
85 90 95

Trp Gly Asn Leu Asp Met Leu Ser Lys Ser Val Arg Val Ala Ala Glu  
100 105 110

Lys Leu Met Ala Thr Thr Ala Glu Asn Thr Gly Leu Val Phe Ser Val  
115 120 125

Cys Met Pro Tyr Asn Ser Thr Ser Glu Ile Val Asn Ala Val Asn Lys  
130 135 140

Val Cys Ala Glu Arg Arg Asp Ile Leu Gln Arg Glu Asp Ala Asp Ser  
145 150 155 160

Val Ala Asn Asn Gly Val Tyr Ser Asp Ile Ser Val Ala Asp Leu Asp  
165 170 175

Arg His Met Tyr Ser Ala Gly Cys Pro Asp Pro Asp Ile Val Ile Arg  
180 185 190

Thr Ser Gly Glu Thr Arg Leu Ser Asn Phe Leu Leu Trp Gln Thr Thr  
195 200 205

Phe Ser His Leu Gln Asn Pro Asp Pro Leu Trp Pro Glu Phe Ser Phe  
210 215 220

Lys His Leu Val Trp Ala Ile Leu Gln Tyr Gln Arg Val His Pro Ser  
225 230 235 240

Ile Glu Gln Ser Arg Asn Leu Ala Lys Lys Gln Leu  
245 250

&lt;210&gt; 13

&lt;211&gt; 299

&lt;212&gt; PRT

&lt;213&gt; Oryza sativa

&lt;400&gt; 13

Met Leu Gly Ser Leu Met Ser Tyr Leu Pro Ser Val Asp Ser Lys Thr  
 1 5 10 15

Glu Asn Thr Asp Glu Leu Ile Ala Thr Gly Val Leu Ala Ser Leu Gln  
 20 25 30

Asn Phe Ile Arg Lys Cys Ile Val Ala Val Leu Ser Tyr Gly Pro Met  
 35 40 45

Pro Lys His Ile Ala Phe Ile Met Asp Gly Asn Arg Arg Tyr Ala Lys  
 50 55 60

Phe Arg Ser Ile Gln Glu Gly Ser Gly His Arg Val Gly Phe Ser Ala  
 65 70 75 80

Leu Ile Ala Ser Leu Leu Tyr Cys Tyr Glu Met Gly Val Lys Tyr Ile  
 85 90 95

Thr Val Tyr Ala Phe Ser Ile Asp Asn Phe Lys Arg Asp Pro Thr Glu  
 100 105 110

Val Lys Ser Leu Met Glu Leu Met Glu Glu Lys Ile Asn Glu Leu Leu  
 115 120 125

Glu Asn Arg Asn Val Ile Asn Lys Val Asn Cys Lys Ile Asn Phe Trp  
 130 135 140

Gly Asn Leu Asp Met Leu Ser Lys Ser Val Arg Val Ala Ala Glu Lys  
 145 150 155 160

Leu Met Ala Thr Thr Ala Glu Asn Thr Gly Leu Val Phe Ser Val Cys  
 165 170 175

Met Pro Tyr Asn Ser Thr Ser Glu Ile Val Asn Ala Val Asn Lys Val  
 180 185 190

Cys Ala Glu Arg Arg Asp Ile Leu Gln Arg Glu Asp Ala Asp Ser Val  
 195 200 205

Ala Asn Asn Gly Val Tyr Ser Asp Ile Ser Val Ala Asp Leu Asp Arg  
 210 215 220

His Met Tyr Ser Ala Gly Cys Pro Asp Pro Asp Ile Val Ile Arg Thr  
 225 230 235 240

Page 14

Phe Glu Arg Thr Ile Asn Ser Glu Val Gln Thr Phe Lys Arg Glu Gly  
165 170 175

Ile Arg Ile Ser Val Ile Gly Asp Ser Ser Arg Leu Pro Glu Ser Leu  
180 185 190

Lys Arg Met Ile Ala Ser Ala Glu Glu Asp Thr Lys Gln Asn Ser Arg  
195 200 205

Phe Gln Leu Ile Val Ala Val Gly Tyr Ser Gly Lys Tyr Asp Val Val  
210 215 220

Gln Ala Cys Lys Ser Val Ala Lys Lys Val Lys Asp Gly His Ile His  
225 230 235 240

Leu Asp Asp Ile Asn Glu Asn Ile Ile Glu Gln Glu Leu Glu Thr Asn  
245 250 255

Cys Thr Glu Phe Pro Tyr Pro Asp Leu Leu Ile Arg Thr Ser Gly Glu  
260 265 270

Leu Arg Val Ser Asn Phe Leu Leu Trp Gln Leu Ala Tyr Thr Glu Leu  
275 280 285

Tyr Phe Asn Arg Glu Leu Trp Pro Asp Phe Gly Lys Asp Glu Phe Val  
290 295 300

Asp Ala Leu Ser Ser Phe Gln Gln Arg Gln Arg Arg Tyr Gly Gly Arg  
305 310 315 320

His Ser

<210> 15

<211> 266

<212> PRT

<213> Triticum aestivum

<400> 15

Met Pro Leu Ser Asn Ser Thr Ser Ser Val Pro Ala Val Thr Val Pro  
1 5 10 15

Ala Ala Glu Glu Leu Leu Ser Gln Gly Leu Arg Ala Glu Ser Leu Pro  
20 25 30

Arg His Val Ala Leu Val Met Asp Gly Asn Ser Arg Trp Ala Ala Ala  
35 40 45

Arg Gly Leu Pro Pro Thr Asp Gly His Glu His Gly Met Arg Ala Leu  
 50 55 60  
 Met Arg Thr Val Arg Leu Ser Arg Ala Trp Gly Ile Arg Val Leu Thr  
 65 70 75 80  
 Ala Phe Gly Phe Ser Leu Glu Asn Trp Asn Arg Pro Lys Ala Glu Val  
 85 90 95  
 Asp Phe Leu Met Ala Leu Ile Glu Arg Phe Ile Asn Asp Asn Leu Ala  
 100 105 110  
 Glu Phe Leu Arg Glu Gly Thr Arg Leu Arg Ile Ile Gly Asp Arg Ser  
 115 120 125  
 Arg Leu Pro Ile Ser Val Gln Lys Thr Ala Arg Asp Ala Glu Glu Ala  
 130 135 140  
 Thr Arg Asn Asn Ser Gln Leu Asp Leu Val Leu Ala Ile Ser Tyr Ser  
 145 150 155 160  
 Gly Arg Met Asp Ile Val Gln Ala Cys Arg Asn Leu Ala Gln Lys Val  
 165 170 175  
 Asp Ala Lys Leu Leu Arg Pro Glu Asp Ile Asp Glu Ser Leu Phe Ala  
 180 185 190  
 Asp Glu Leu Gln Thr Ser Glu Thr Ser Cys Pro Asp Leu Leu Ile Arg  
 195 200 205  
 Thr Ser Gly Glu Leu Arg Leu Ser Asn Phe Leu Leu Trp Gln Ser Ala  
 210 215 220  
 Tyr Ser Glu Leu Phe Phe Thr Asp Thr Leu Trp Pro Asp Phe Gly Glu  
 225 230 235 240  
 Ala Gln Tyr Leu Gln Ala Met Met Ala Phe Gln Ser Arg Asp Arg Arg  
 245 250 255  
 Phe Gly Arg Arg Lys Asn Asn Ala Ala Leu  
 260 265

&lt;210&gt; 16

&lt;211&gt; 287

&lt;212&gt; PRT

&lt;213&gt; Dimorphotheca sinuata

&lt;400&gt; 16

Met Leu Asn Leu Pro Leu Tyr Leu Pro Lys Tyr Pro Cys Tyr Phe Pro



Page 17

<210> 17  
 <211> 750  
 <212> DNA  
 <213> Micrococcus luteus

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<301> Shimizu, N., Koyama, T. and Ogura, K.

<302> Molecular Cloning, Expression, and Purification of Undecprenyl Diphosphate Synthase: No Sequence Similarity between E- and Z-prenyl Diphosphate Synthases

<303> J. Biol. Chem.

<304> 273

<305> 31

<306> 19476-19481

<307> 1998-07-31

<308> AB004319

<309> 1997-05-29

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 agtgatttag gtgtaaagta cttaacgctg tacgcatttt caactgaaa ttggtctcgt 240  
 cctaaagatg aggttaatta ctgatgaaa ctaccgggtg atttttttaa cacattttta 300  
 ccggaactca ttgaaaaaaa tgtaaagtt gaaacgattg gctttattga tgatttaccg 360  
 gaccatacaa aaaaagcagt gttagaagcg aaagagaaaa cgaaacataa tacaggttta 420  
 acgctcgtgt ttgcactgaa ttatggtggg cgtaaagaaa ttatttcagc agtgcagtta 480  
 atcgcagagc gttacaaatc tggtgaaatt tctttagatg aaattagtga aactcatttt 540  
 aatgaatatt tatttacagc aaatatgcct gatcctgagt tgtaatcag aacttccggt 600  
 gaagaacgtt taagtaactt ttaatttgg caatgttcat atagtgagtt tgtatttata 660  
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<210> 18  
 <211> 249  
 <212> PRT

&lt;213&gt; Micrococcus luteus

&lt;400&gt; 18

Met Phe Pro Ile Lys Lys Arg Lys Ala Ile Lys Asn Asn Asn Ile Asn  
 1 5 10 15

Ala Ala Gln Ile Pro Lys His Ile Ala Ile Ile Met Asp Gly Asn Gly  
 20 25 30

Arg Trp Ala Lys Gln Lys Lys Met Pro Arg Ile Lys Gly His Tyr Glu  
 35 40 45

Gly Met Gln Thr Val Lys Lys Ile Thr Arg Tyr Ala Ser Asp Leu Gly  
 50 55 60

Val Lys Tyr Leu Thr Leu Tyr Ala Phe Ser Thr Glu Asn Trp Ser Arg  
 65 70 75 80

Pro Lys Asp Glu Val Asn Tyr Leu Met Lys Leu Pro Gly Asp Phe Leu  
 85 90 95

Asn Thr Phe Leu Pro Glu Leu Ile Glu Lys Asn Val Lys Val Glu Thr  
 100 105 110

Ile Gly Phe Ile Asp Asp Leu Pro Asp His Thr Lys Lys Ala Val Leu  
 115 120 125

Glu Ala Lys Glu Lys Thr Lys His Asn Thr Gly Leu Thr Leu Val Phe  
 130 135 140

Ala Leu Asn Tyr Gly Gly Arg Lys Glu Ile Ile Ser Ala Val Gln Leu  
 145 150 155 160

Ile Ala Glu Arg Tyr Lys Ser Gly Glu Ile Ser Leu Asp Glu Ile Ser  
 165 170 175

Glu Thr His Phe Asn Glu Tyr Leu Phe Thr Ala Asn Met Pro Asp Pro  
 180 185 190

Glu Leu Leu Ile Arg Thr Ser Gly Glu Glu Arg Leu Ser Asn Phe Leu  
 195 200 205

Ile Trp Gln Cys Ser Tyr Ser Glu Phe Val Phe Ile Asp Glu Phe Trp  
 210 215 220

Pro Asp Phe Asn Glu Glu Ser Leu Ala Gln Cys Ile Ser Ile Tyr Gln  
 225 230 235 240

Asn Arg His Arg Arg Phe Gly Gly Leu  
 245

&lt;210&gt; 19

&lt;211&gt; 861

&lt;212&gt; DNA

<213> *Saccharomyces cerevisiae*

&lt;400&gt; 19

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gggaacagga gattcgttag aaagaaagag atggacgtaa aggagggcca cgaggcagga    180
tttgtttagta tgagttagaat cttagaactg tgttatgaag caggagtcga tacggctacc    240
gtgtttgcct tttcaattga aaatttcaag aggagctcac gggaagttga atcactgatg    300
acttttagcgc gcgaaaggat acgacaaatc acagaacgtg gagagctggc ctgtaagtat    360
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ccatatacag gcagggaaga aatcttgcac gccatgaaag aaacaattgt tcaacataag    540
aagggcgccg ctatagacga aagcacgtta gaatcgcatc tctacacggc ggggggtaccc    600
ccttttagatt tattgattag gacaagtggc gtttccagat taagtgactt tttgatatgg    660
caggcatcga gtaagggcgt acgcatcgaa ttgctggatt gtttatggcc agagtttggg    720
cctatacggg tggcatggat tttattaaaa ttttcgtttc acaaatcctt tttaaacaaa    780
gagtacagat tagaggaagg tgattatgac gaggaaacca atggggaccc catcgatttg    840
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&lt;210&gt; 20

&lt;211&gt; 286

&lt;212&gt; PRT

<213> *Saccharomyces cerevisiae*

&lt;400&gt; 20

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Met Glu Thr Asp Ser Gly Ile Pro Gly His Ser Phe Val Leu Lys Trp
1           5           10           15
Thr Lys Asn Ile Phe Ser Arg Thr Leu Arg Ala Ser Asn Cys Val Pro
          20           25           30
Arg His Val Gly Phe Ile Met Asp Gly Asn Arg Arg Phe Ala Arg Lys
          35           40           45
Lys Glu Met Asp Val Lys Glu Gly His Glu Ala Gly Phe Val Ser Met
          50           55           60

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Ser Arg Ile Leu Glu Leu Cys Tyr Glu Ala Gly Val Asp Thr Ala Thr  
 65 70 75 80  
 Val Phe Ala Phe Ser Ile Glu Asn Phe Lys Arg Ser Ser Arg Glu Val  
 85 90 95  
 Glu Ser Leu Met Thr Leu Ala Arg Glu Arg Ile Arg Gln Ile Thr Glu  
 100 105 110  
 Arg Gly Glu Leu Ala Cys Lys Tyr Gly Val Arg Ile Lys Ile Ile Gly  
 115 120 125  
 Asp Leu Ser Leu Leu Asp Lys Ser Leu Leu Glu Asp Val Arg Val Ala  
 130 135 140  
 Val Glu Thr Thr Lys Asn Asn Lys Arg Ala Thr Leu Asn Ile Cys Phe  
 145 150 155 160  
 Pro Tyr Thr Gly Arg Glu Glu Ile Leu His Ala Met Lys Glu Thr Ile  
 165 170 175  
 Val Gln His Lys Lys Gly Ala Ala Ile Asp Glu Ser Thr Leu Glu Ser  
 180 185 190  
 His Leu Tyr Thr Ala Gly Val Pro Pro Leu Asp Leu Leu Ile Arg Thr  
 195 200 205  
 Ser Gly Val Ser Arg Leu Ser Asp Phe Leu Ile Trp Gln Ala Ser Ser  
 210 215 220  
 Lys Gly Val Arg Ile Glu Leu Leu Asp Cys Leu Trp Pro Glu Phe Gly  
 225 230 235 240  
 Pro Ile Arg Met Ala Trp Ile Leu Leu Lys Phe Ser Phe His Lys Ser  
 245 250 255  
 Phe Leu Asn Lys Glu Tyr Arg Leu Glu Glu Gly Asp Tyr Asp Glu Glu  
 260 265 270  
 Thr Asn Gly Asp Pro Ile Asp Leu Lys Glu Lys Lys Leu Asn  
 275 280 285

&lt;210&gt; 21

&lt;211&gt; 1032

&lt;212&gt; DNA

&lt;213&gt; saccharomyces cerevisiae

&lt;400&gt; 21

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atgaaaatgc ccagtattat tcagattcag tttgtagccc taaaaaggct tttggtagaa      60
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atgtcattaa gcttggtttc atgggtttat gtaaactctc agaataatatt gataaaagca      180
ttaagggtag ggccagtgcc tgaacatgtc tcctttatca tggatggtaa ccggagatat      240
gccaagtcaa gaaggctacc agtaaaaaaa ggccatgaag ctggtggggt aacggtacta      300
acactactgt atatctgcaa aagattgggt gtaaaatgtg tttccgccta tgcattttct      360
attgaaaatt ttaatagacc aaaagaagaa gtagatacgc taatgaattt gtttacggta      420
aagcttgatg aattcgcaaa aagagccaag gactataagg atcccttata cggatctaaa      480
ataagaatag taggtgatca atctttacta tctccagaaa tgagaaaaaa aattaaaaaa      540
gtggaagaaa tcacacagga tggagacgat ttcactttat ttatatgttt tccttacct      600
tcaagaaatg atatgttaca tactattcgt gattcagttg aagaccattt ggaaaaataaa      660
tcaccaagga ttaatataag aaaatttact aataaaatgt acatggggtt ccattccaat      720
aaatgtgaat tattaatcag aacaagtggg cataggaggc tctcagacta tatgctatgg      780
caagtacatg aaaatgccac cattgaattt agtgatacgt tgtggccaaa ttttagcttc      840
tttgctatgt acctgatgat tctcaaatgg tccttctttt ccaccattca aaaatataat      900
gagaagaatc actcattgtt tgaaaaaata catgaaagcg ttccttcaat atttaaaaaa      960
aagaaaacag ctatgtcttt gtacaacttt ccaaaccccc ccatttcagt ttcggttaca     1020
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&lt;210&gt; 22

&lt;211&gt; 343

&lt;212&gt; PRT

<213> *Saccharomyces cerevisiae*

&lt;400&gt; 22

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Met Lys Met Pro Ser Ile Ile Gln Ile Gln Phe Val Ala Leu Lys Arg
1           5           10          15
Leu Leu Val Glu Thr Lys Glu Gln Met Cys Phe Ala Val Lys Ser Ile
20          25          30
Phe Gln Arg Val Phe Ala Trp Val Met Ser Leu Ser Leu Phe Ser Trp
35          40          45
Phe Tyr Val Asn Leu Gln Asn Ile Leu Ile Lys Ala Leu Arg Val Gly
50          55          60
Pro Val Pro Glu His Val Ser Phe Ile Met Asp Gly Asn Arg Arg Tyr
65          70          75          80

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Ala Lys Ser Arg Arg Leu Pro Val Lys Lys Gly His Glu Ala Gly Gly  
85 90 95

Leu Thr Leu Leu Thr Leu Leu Tyr Ile Cys Lys Arg Leu Gly Val Lys  
100 105 110

Cys Val Ser Ala Tyr Ala Phe Ser Ile Glu Asn Phe Asn Arg Pro Lys  
115 120 125

Glu Glu Val Asp Thr Leu Met Asn Leu Phe Thr Val Lys Leu Asp Glu  
130 135 140

Phe Ala Lys Arg Ala Lys Asp Tyr Lys Asp Pro Leu Tyr Gly Ser Lys  
145 150 155 160

Ile Arg Ile Val Gly Asp Gln Ser Leu Leu Ser Pro Glu Met Arg Lys  
165 170 175

Lys Ile Lys Lys Val Glu Glu Ile Thr Gln Asp Gly Asp Asp Phe Thr  
180 185 190

Leu Phe Ile Cys Phe Pro Tyr Thr Ser Arg Asn Asp Met Leu His Thr  
195 200 205

Ile Arg Asp Ser Val Glu Asp His Leu Glu Asn Lys Ser Pro Arg Ile  
210 215 220

Asn Ile Arg Lys Phe Thr Asn Lys Met Tyr Met Gly Phe His Ser Asn  
225 230 235 240

Lys Cys Glu Leu Leu Ile Arg Thr Ser Gly His Arg Arg Leu Ser Asp  
245 250 255

Tyr Met Leu Trp Gln Val His Glu Asn Ala Thr Ile Glu Phe Ser Asp  
260 265 270

Thr Leu Trp Pro Asn Phe Ser Phe Phe Ala Met Tyr Leu Met Ile Leu  
275 280 285

Lys Trp Ser Phe Phe Ser Thr Ile Gln Lys Tyr Asn Glu Lys Asn His  
290 295 300

Ser Leu Phe Glu Lys Ile His Glu Ser Val Pro Ser Ile Phe Lys Lys  
305 310 315 320

Lys Lys Thr Ala Met Ser Leu Tyr Asn Phe Pro Asn Pro Pro Ile Ser  
325 330 335

Val ser Val Thr Gly Asp Glu  
340

&lt;211&gt; 271

&lt;212&gt; PRT

&lt;213&gt; Arabidopsis

&lt;400&gt; 23

Met Asn Thr Leu Glu Glu Val Asp Glu Ser Thr His Ile Phe Asn Ala  
 1 5 10 15

Leu Met Ser Leu Met Arg Lys Phe Leu Phe Arg Val Leu Cys Val Gly  
 20 25 30

Pro Ile Pro Thr Asn Ile Ser Phe Ile Met Asp Gly Asn Arg Arg Phe  
 35 40 45

Ala Lys Lys His Asn Leu Ile Gly Leu Asp Ala Gly His Arg Ala Gly  
 50 55 60

Phe Ile Ser Val Lys Tyr Ile Leu Gln Tyr Cys Lys Glu Ile Gly Val  
 65 70 75 80

Pro Tyr Val Thr Leu His Ala Phe Gly Met Asp Asn Phe Lys Arg Gly  
 85 90 95

Pro Glu Glu Val Lys Cys Val Met Asp Leu Met Leu Glu Lys Val Glu  
 100 105 110

Leu Ala Ile Asp Gln Ala Val Ser Gly Asn Met Asn Gly Val Arg Ile  
 115 120 125

Ile Phe Ala Gly Asp Leu Asp Ser Leu Asn Glu His Phe Arg Ala Ala  
 130 135 140

Thr Lys Lys Leu Met Glu Leu Thr Glu Glu Asn Arg Asp Leu Ile Val  
 145 150 155 160

Val Val Cys Val Ala Tyr Ser Thr Ser Leu Glu Ile Val His Ala Val  
 165 170 175

Arg Lys Ser Cys Val Arg Lys Cys Thr Asn Gly Asp Asp Leu Val Leu  
 180 185 190

Leu Glu Leu Ser Asp Val Glu Glu Cys Met Tyr Thr Ser Ile Val Pro  
 195 200 205

Val Pro Asp Leu Val Ile Arg Thr Gly Gly Gly Asp Arg Leu Ser Asn  
 210 215 220

Phe Met Thr Trp Gln Thr Ser Arg Ser Leu Leu His Arg Thr Glu Ala  
 225 230 235 240



Leu Trp Pro Glu Leu Gly Leu Trp His Leu Val Trp Ala Ile Leu Lys  
 245 250 255

Phe Gln Arg Met Gln Asp Tyr Leu Thr Lys Lys Lys Lys Leu Asp  
 260 265 270

<210> 24

<211> 295

<212> PRT

<213> Arabidopsis

<400> 24

Met Ala Glu Leu Pro Gly Gln Ile Arg His Ile Gly Gly Arg Met Ser  
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Gln Leu Leu Glu Gln Ile Tyr Gly Phe Ser Arg Arg Ser Leu Phe Arg  
 20 25 30

Val Ile Ser Met Gly Pro Ile Pro Cys His Ile Ala Phe Ile Met Asp  
 35 40 45

Gly Asn Arg Arg Tyr Ala Lys Lys Cys Gly Leu Leu Asp Gly Ser Gly  
 50 55 60

His Lys Ala Gly Phe Ser Ala Leu Met Ser Met Leu Gln Tyr Cys Tyr  
 65 70 75 80

Glu Leu Gly Ile Lys Tyr Val Thr Ile Tyr Ala Phe Ser Ile Asp Asn  
 85 90 95

Phe Arg Arg Lys Pro Glu Glu Val Glu Ser Val Met Asp Leu Met Leu  
 100 105 110

Glu Lys Ile Lys Ser Leu Leu Glu Lys Glu Ser Ile Val His Gln Tyr  
 115 120 125

Gly Ile Arg Val Tyr Phe Ile Gly Asn Leu Ala Leu Leu Asn Asp Gln  
 130 135 140

Val Arg Ala Ala Ala Glu Lys Val Met Lys Ala Thr Ala Lys Asn Ser  
 145 150 155 160

Arg Val Val Leu Leu Ile Cys Ile Ala Tyr Asn Ser Thr Asp Glu Ile  
 165 170 175

Val Gln Ala Val Lys Lys Ser Cys Ile Asn Lys Ser Asp Asn Ile Glu  
 180 185 190

Ala Ser Asn Tyr Lys His Glu Asp Ser Asp Ser Asp Ile Glu Gly Thr  
 195 200 205

Asp Met Glu Asn Gln Glu Lys Lys Ile Gln Leu Val Asp Ile Glu Glu  
 210 215 220

Asn Met Gln Met Ser Val Ala Pro Asn Pro Asp Ile Leu Ile Arg Ser  
 225 230 235 240

Ser Gly Glu Thr Arg Leu Ser Asn Phe Leu Leu Trp Gln Thr Gly Asn  
 245 250 255

Thr Gln Leu Cys Ser Pro Ala Ala Leu Trp Pro Glu Ile Gly Leu Arg  
 260 265 270

His Leu Leu Trp Ala Ile Leu Asn Phe Gln Arg Asn His Ser Tyr Leu  
 275 280 285

Glu Lys Arg Lys Lys Gln Leu  
 290 295

&lt;210&gt; 25

&lt;211&gt; 303

&lt;212&gt; PRT

&lt;213&gt; Arabidopsis

&lt;400&gt; 25

Met Leu Ser Leu Leu Ser Ser Asp Ser Ser Leu Leu Ser Leu Leu Phe  
 1 5 10 15

Leu Phe Leu Ile Pro Cys Leu Phe Ile Thr Ser Tyr Ile Gly Phe Pro  
 20 25 30

Val Phe Leu Leu Lys Leu Ile Gly Leu Ile Lys Ile Lys Ala Ala Arg  
 35 40 45

Asp Asn Glu Lys Arg Asp Glu Gly Thr Tyr Val Val Arg Glu Asp Gly  
 50 55 60

Leu Gln Arg Glu Leu Met Pro Arg His Val Ala Phe Ile Leu Asp Gly  
 65 70 75 80

Asn Arg Arg Trp Ala Lys Arg Ala Gly Leu Thr Thr Ser Gln Gly His  
 85 90 95

Glu Ala Gly Ala Lys Arg Leu Ile Asp Ile Ala Glu Leu Cys Phe Glu  
 100 105 110

Leu Gly Val His Thr Val Ser Ala Phe Ala Phe Ser Thr Glu Asn Trp  
 115 120 125

Gly Arg Asp Lys Ile Glu Ile Asp Asn Leu Met Ser Leu Ile Gln His  
 130 135 140

Tyr Arg Asn Lys Ser Asn Ile Lys Phe Phe His Arg Ser Glu Val Arg  
 145 150 155 160

Val Ser Val Ile Gly Asn Lys Thr Lys Ile Pro Glu Ser Leu Leu Lys  
 165 170 175

Glu Ile His Glu Ile Glu Glu Ala Thr Lys Gly Tyr Lys Asn Lys His  
 180 185 190

Leu Ile Met Ala Val Asp Tyr Ser Gly Lys Phe Asp Ile Met His Ala  
 195 200 205

Cys Lys Ser Leu Val Lys Lys Ser Glu Lys Gly Leu Ile Arg Glu Glu  
 210 215 220

Asp Val Asp Glu Ala Leu Ile Glu Arg Glu Leu Leu Thr Asn Cys Ser  
 225 230 235 240

Asp Phe Pro Ser Pro Asp Leu Met Ile Arg Thr Ser Gly Glu Gln Arg  
 245 250 255

Ile Ser Asn Phe Phe Leu Trp Gln Leu Ala Tyr Ser Glu Leu Phe Phe  
 260 265 270

Ser Pro Val Phe Trp Pro Asp Phe Asp Lys Asp Lys Leu Leu Glu Ala  
 275 280 285

Leu Ala Ser Tyr Gln Arg Arg Glu Arg Arg Phe Gly Cys Arg Val  
 290 295 300

<210> 26

<211> 244

<212> PRT

<213> Arabidopsis

<400> 26

Met Gly Glu Lys Gln Lys Arg Gly Arg Asn Ile Met Pro Lys His Val  
 1 5 10 15

Ala Val Ile Leu Asp Gly Asn Arg Arg Trp Ala Glu Lys Arg Gly Leu  
 20 25 30

Gly Thr Ser Glu Gly His Glu Ala Gly Ala Arg Arg Leu Met Glu Asn  
 Page 27

35

40

45

Ala Lys Asp Cys Phe Ala Met Gly Thr Asn Thr Ile Ser Leu Phe Ala  
 50 55 60

Phe Ser Thr Glu Asn Trp Glu Arg Pro Glu Asp Glu Val Lys Cys Leu  
 65 70 75 80

Met Ala Leu Phe Glu Lys Tyr Leu Ala Ser Asp Met Pro Tyr Leu Arg  
 85 90 95

Ser Asp Lys Ile Lys Ile Ser Val Ile Gly Asn Arg Thr Lys Leu Pro  
 100 105 110

Glu Ser Leu Leu Gly Leu Ile Glu Glu Val Glu Glu Ala Thr Lys Ser  
 115 120 125

Tyr Glu Gly Lys Asn Leu Ile Ile Ala Ile Asp Tyr Ser Gly Arg Tyr  
 130 135 140

Asp Ile Leu Gln Ala Cys Lys Ser Leu Ala Asn Lys Val Lys Asp Gly  
 145 150 155 160

Leu Ile Gln Val Glu Asp Ile Asn Glu Lys Ala Met Glu Lys Glu Leu  
 165 170 175

Leu Thr Lys Cys Ser Glu Phe Pro Asn Pro Asp Leu Leu Ile Arg Thr  
 180 185 190

Ser Gly Glu Gln Arg Ile Ser Asn Phe Phe Leu Trp Gln Ser Ala Tyr  
 195 200 205

Thr Glu Leu Tyr Phe Pro Thr Val Leu Trp Pro Asp Phe Gly Glu Ala  
 210 215 220

Glu Tyr Leu Glu Ala Leu Thr Trp Tyr Gln Gln Arg Gln Arg Arg Phe  
 225 230 235 240

Gly Arg Arg Val

<210> 27

<211> 21

<212> PRT

<213> Artificial sequence

<220>

<223> Domain IV consensus sequence from Figure 1 alignment

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<222> (13)..(13)

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<222> (20)..(20)

<223> Xaa = any amino acid

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Tyr Ser Gly Arg Xaa Glu Ile Val Xaa Ala Val Lys Xaa Ser Xaa Xaa  
1 5 10 15

Lys Xaa Xaa Xaa Gly  
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<210> 28

<211> 47

<212> PRT

<213> Artificial Sequence

<220>

<223> Domain V consensus sequence from Figure 1 alignment

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<222> (35)..(35)

<223> Xaa = any amino acid

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Ile Xaa Xaa Xaa Glu Ile Xaa Xaa Xaa Leu Xaa Asp Xaa Glu Leu Xaa  
1 5 10 15

Xaa Asn Xaa Xaa Xaa Xaa Pro Xaa Pro Asp Leu Leu Ile Arg Thr Ser  
20 25 30

Gly Glu Xaa Arg Leu Ser Asn Phe Leu Leu Trp Gln Thr Ala Tyr  
35 40 45



<210> 29  
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<212> PRT  
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<220>

<223> Consensus Sequence from Apfel CM et al. (J Bacteriol 1999 Jan;181  
(2):483-492)

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<223> Xaa = R or G

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His Xaa Xaa Xaa Xaa Met Asp Gly Asn Xaa Arg Xaa Ala  
1 5 10

<210> 30

<211> 5

<212> PRT

<213> Artificial Sequence

<220>

<223> Consensus Sequence from Apfel CM et al. (J Bacteriol 1999 Jan;181(2):483-492)

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Gly His Xaa Xaa Gly  
1 5

<210> 31

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<222> (13)..(13)

<223> Xaa = any amino acid

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&lt;221&gt; MISC\_FEATURE

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&lt;220&gt;

&lt;221&gt; MISC\_FEATURE

&lt;222&gt; (15)..(15)

&lt;223&gt; Xaa = any amino acid

&lt;220&gt;

&lt;221&gt; MISC\_FEATURE

&lt;222&gt; (18)..(18)

&lt;223&gt; Xaa = any amino acid

&lt;220&gt;

&lt;221&gt; MISC\_FEATURE

&lt;222&gt; (19)..(19)

&lt;223&gt; Xaa = any amino acid

&lt;220&gt;

&lt;221&gt; MISC\_FEATURE

&lt;222&gt; (22)..(22)

&lt;223&gt; Xaa = any amino acid

&lt;400&gt; 31

Xaa Xaa Xaa Ala phe Ser Xaa Glu Asn Xaa Xaa Arg Xaa Xaa Xaa Glu  
1 5 10 15

Val Xaa Xaa Leu Met Xaa Leu  
20

&lt;210&gt; 32

&lt;211&gt; 13

&lt;212&gt; PRT

&lt;213&gt; Artificial sequence

<220>

<223> Consensus Sequence from Apfel CM et al. (J Bacteriol 1999 Jan;181 (2):483-492)

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Ala Xaa Xaa Tyr Gly Gly Arg Xaa Xaa Xaa Xaa Xaa Ala  
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(2):483-492)

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&lt;220&gt;

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&lt;222&gt; (28)..(28)

&lt;223&gt; xaa = any amino acid

&lt;220&gt;

&lt;221&gt; MISC\_FEATURE

&lt;222&gt; (29)..(29)

&lt;223&gt; xaa = any amino acid

&lt;220&gt;

&lt;221&gt; MISC\_FEATURE

&lt;222&gt; (30)..(30)

&lt;223&gt; xaa = any amino acid

&lt;220&gt;

&lt;221&gt; MISC\_FEATURE

&lt;222&gt; (31)..(31)

&lt;223&gt; xaa = any amino acid

&lt;220&gt;

&lt;221&gt; MISC\_FEATURE

&lt;222&gt; (34)..(34)

&lt;223&gt; xaa = D or E

&lt;400&gt; 33

Xaa Leu Xaa Ile Arg Thr Xaa Gly Glu Xaa Arg Xaa Ser Asn Phe Xaa  
 1 5 10 15

Xaa Trp Gln Xaa Xaa Tyr Xaa Glu Xaa Xaa Phe Xaa Xaa Xaa Xaa Trp  
 Page 40



20

25

30

Pro Xaa Phe  
1 35

&lt;210&gt; 34

&lt;211&gt; 35

&lt;212&gt; PRT

&lt;213&gt; Artificial Sequence

&lt;220&gt;

&lt;223&gt; Consensus Sequence

&lt;400&gt; 34

Asp Ile Leu Val Arg Ser Ser Gly Glu Thr Arg Leu Ser Asn Phe Leu  
1 5 10 15

Leu Trp Gln Thr Thr Asn Cys Val Leu Tyr Ser Pro Lys Ala Leu Trp  
20 25 30

Pro Glu Met  
35

&lt;210&gt; 35

&lt;211&gt; 10

&lt;212&gt; PRT

&lt;213&gt; Artificial Sequence

&lt;220&gt;

&lt;223&gt; Artificial and non-naturally occurring peptide

&lt;400&gt; 35

Glu Leu Val Ile Ser Leu Ile Val Glu Ser  
1 5 10

&lt;210&gt; 36

&lt;211&gt; 21

&lt;212&gt; DNA

&lt;213&gt; Artificial Sequence

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21

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Pro Xaa Pro Asp Xaa Leu Xaa Arg Xaa Ser Gly Xaa Xaa Arg Leu Ser  
1 5 10 15

Asn Xaa Leu Leu Trp Gln  
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<223> Primer Dan5

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ctcgacaatt tcaatcgacg cc

22

<210> 42

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<212> DNA

<213> Artificial Sequence

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<223> Primer Dan6

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gaaggaagtt gctcagcctt gt

22

<210> 43

<211> 21

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<213> Artificial Sequence

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<223> Primer DegHpts

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21

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<213> Taraxacum kok-saghyz

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Leu Val Phe Ile Leu Asp Gly Asn Arg Arg Phe Ala Arg Lys Trp Asn  
1 5 10 15

Leu Thr Glu Gly Ala Gly His Lys Thr Gly Phe Leu Ala Leu Met Ser  
20 25 30

Val Leu Lys Tyr Cys Tyr Glu Ile Gly Val Lys Tyr Val Thr Ile Tyr  
35 40 45

Ala Phe Ser Leu Asp Asn Phe Asn Arg Arg Pro Asp Glu Val Gln Tyr  
50 55 60

Val Met Asp Leu Met Gln Asp Lys Ile Glu Gly Phe Leu Lys Glu Val  
65 70 75 80

Ser Ile Ile Asn Gln Tyr Gly Val Arg Val Leu Phe Ile Gly Asp Leu  
85 90 95

Asp Arg Leu Tyr Glu Pro Val Arg Ile Ala Ala Glu Lys Ala Met Glu  
100 105 110

Ala Thr Ala Lys Asn Ser Thr Thr Tyr Leu Leu Val Cys Val Ala Tyr  
115 120 125

Thr Ser Ser His Glu Ile Pro Arg Ala Ile His Glu Ala Cys Glu Glu  
130 135 140

Ser Ile Arg Val Met Asn Gly Asn Gly Phe Phe Asn Gly Ser Gly Tyr  
145 150 155 160

Thr Asn Val Asn His Gly Ser Gln Ala Val Ile Lys Val Val Asp Leu  
165 170 175

Asp Lys His Met Tyr Met Gly Val Ala Pro Asp Pro Asp Ile Leu Val  
180 185 190

Arg Ser Ser Gly Glu Thr Arg Leu Ser Asn Phe Leu Leu Trp His Lys  
195 200 205